FEATURES

- 60 WATTS MAXIMUM OUTPUT POWER
- SINGLE OUTPUT UP TO 14A
- STANDARD 2.0 X 2.0 X 0.4 INCH PACKAGE
- HIGH EFFICIENCY UP TO 90%
- 2:1 WIDE INPUT VOLTAGE RANGE
- SIX-SIDED CONTINUOUS SHIELD
- FIXED SWITCHING FREQUENCY
- APPROVED FOR BASIC INSULATION
- NO MINIMUM LOAD REQUIRED
- CE MARK MEETS 2006/95/EC, 93/68/EEC AND 2004/108/EC
- UL60950-1, EN60950-1 AND IEC60950-1 LICENSED
- ISO9001 CERTIFIED MANUFACTURING FACILITIES
- COMPLIANT TO RoHS EU DIRECTIVE 2002/95/EC

APPLICATIONS

Wireless Network
Telecom/Datacom
Industry Control System
Measurement Equipment
Semiconductor Equipment

OPTIONS

Negative logic Remove On/Off

DESCRIPTION

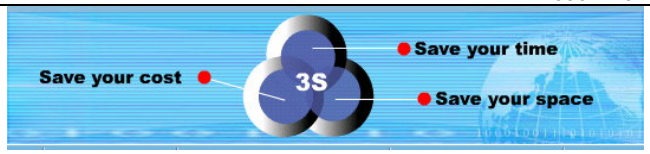
The FEC60 series offer 60 watts of output power from a 2.00 x 2.00 x 0.4 inch package. The FEC60 series with 2:1 wide input voltage of 18-36VDC and 36-75VDC and features 1600VDC of isolation, short-circuit and over-voltage protection.

TECHNICAL SPECIFICATION

All specifications are typical at nominal input, full load and 25ºC otherwise noted

OUTPUT SPECIFICATIONS		
Output power		60 Watts, max.
Voltage accuracy	FL and nominal Vin	± 1%
Minimum load		0%
Voltage adjustability (Note 6)		± 10%
Line regulation	LL to HL at Full Load	± 0.2%
Load regulation	No Load to Full Load	± 0.5%
Temperature coefficient		±0.02% / ºC, max.
Transient response recovery time	25% load step change	250µS
Over voltage protection (Voltage clamped)	3.3V output 5V output 12V output 15V output	3.7VDC-5.4VDC 5.6VDC-7.0VDC 13.8VDC-17.5VDC 16.8VDC-20.5VDC
Over load protection	% of FL at nominal input	150%, max.
Short circuit protection		Hiccup, automatics recovery

GENERAL SPECIFICATIONS		
Efficiency		See table
Isolation voltage (Basic insulation)	Input to Output Input(Output) to Case	1600VDC, min. 1600VDC, min.
Case grounding		Connect case to –Vin with decoupling Y Cap
Isolation resistance		10^9 ohms, min.
Isolation capacitance		1500pF, max.
Switching frequency		300KHz, typ.
Approvals and standard		IEC60950-1, UL60950-1, EN60950-1
Case material		Nickel-coated copper
Base material		FR4 PCB
Potting material		Epoxy (UL94-V0)
Dimensions		2.00 X 2.00 X 0.40 Inch (50.8 X 50.8 X 10.2 mm)
Weight		60g (2.11oz)
MTBF (Note 1)	BELLCORE TR-NWT-000332 MIL-HDBK-217F	1.093 x 10^6 hrs 1.096 x 10^5 hrs



INPUT SPECIFICATIONS			
Input voltage range	24V nominal input 48V nominal input		18 – 36VDC 36 – 75VDC
Input filter			Pi type
Input surge voltage 100mS max	24V input 48V input		50VDC 100VDC
Input reflected ripple current	Nominal Vin and full load		20mAp-p
Start up time	Nominal Vin and constant resistive load	Power up Remote ON/OFF	20mS, max. 20mS, max.
Start-up voltage	24V input 48V input		17V, typ. 34V, typ.
Shutdown voltage	24V input 48V input		15V, typ. 32V, typ.
Remote ON/OFF (Note 7) Positive logic (standard) Negative logic (option)	 DC-DC ON DC-DC OFF DC-DC ON DC-DC OFF		 Open or 3V < Vr < 12V Short or 0V < Vr < 1.2V Short or 0V < Vr < 1.2V Open or 3V < Vr < 12V
Input current of Remote control pin	Nominal Vin		-0.5mA~1.0mA
Remote off state input current	Nominal Vin		4mA

ENVIRONMENTAL SPECIFICATIONS		
Operating ambient temperature (Note8)		-40ºC ~ +40ºC (without derating) +40ºC ~ +110ºC (with derating)
Maximum case temperature		+110ºC
Storage temperature range		-55ºC ~ +125ºC
Over temperature protection		120ºC, typ.
Thermal impedance (Note 9)	Without Heat-sink With Heat-sink	10.5ºC/Watt 8.4ºC/Watt
Thermal shock		MIL-STD-810F
Vibration		MIL-STD-810F
Relative humidity		5% to 95% RH

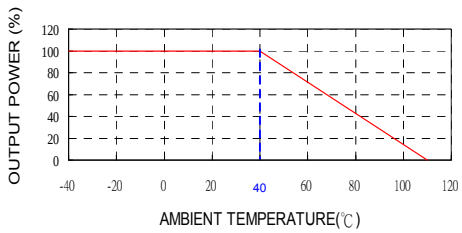
EMC CHARACTERISTICS				
EMI (Note 10)	EN55022			Class A
ESD	EN61000-4-2	Air Contact	± 8KV ± 6KV	Perf. Criteria A
Radiated immunity	EN61000-4-3		10 V/m	Perf. Criteria A
Fast transient (Note 11)	EN61000-4-4		± 2KV	Perf. Criteria A
Surge (Note 11)	EN61000-4-5		± 1KV	Perf. Criteria A
Conducted immunity	EN61000-4-6		10 Vr.m.s	Perf. Criteria A

Model Number	Input Range	Output Voltage	Output Current		Output [4] Ripple & Noise	Input Current		Eff [4] (%)	Capacitor [5] Load max
			Min. load	Full load		No load[3]	Full load[2]		
FEC60-24S3P3	18 – 36 VDC	3.3 VDC	0mA	14000mA	75mVp-p	100mA	2264mA	89	36000μF
FEC60-24S05	18 – 36 VDC	5 VDC	0mA	12000mA	75mVp-p	130mA	2941mA	90	20400μF
FEC60-24S12	18 – 36 VDC	12 VDC	0mA	5000mA	100mVp-p	150mA	2907mA	90	3550μF
FEC60-24S15	18 – 36 VDC	15 VDC	0mA	4000mA	100mVp-p	150mA	2907mA	90	2300μF
FEC60-48S3P3	36 – 75 VDC	3.3 VDC	0mA	14000mA	75mVp-p	80mA	1132mA	89	36000μF
FEC60-48S05	36 – 75 VDC	5 VDC	0mA	12000mA	75mVp-p	90mA	1453mA	90	20400μF
FEC60-48S12	36 – 75 VDC	12 VDC	0mA	5000mA	100mVp-p	100mA	1453mA	90	3550μF
FEC60-48S15	36 – 75 VDC	15 VDC	0mA	4000mA	100mVp-p	100mA	1453mA	90	2300μF

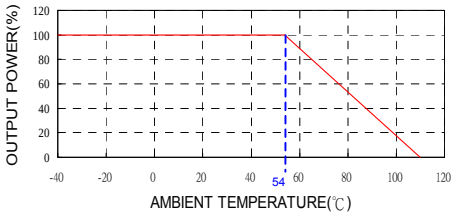
Note

1. BELLCORE TR-NWT-000332. Case 1: 50% Stress, Temperature at 40ºC.
   MIL-HDBK-217F Notice2 @Ta=25 ºC, Full load(Ground, Benign, controlled environment)
2. Maximum value at nominal input voltage and full load.
3. Typical value at nominal input voltage and no load.
4. Typical value at nominal input voltage and full load.
5. Test by minimum Vin and constant resistive load.
6. Maximum output deviation is 10% inclusive of remote sense and trim. If remote sense is not being used, the +sense should be connected to its corresponding +OUTPUT and likewise the -sense should be connected to its corresponding –OUTPUT.
7. The ON/OFF control pin voltage is referenced to –Vin.
   To order negative logic ON/OFF control add the suffix-N (Ex: FEC60-48S05-N).
8. Test condition with vertical direction by natural convection.
9. Heat sink is optional and P/N：7G-0026C-F.
10. The FEC60 series can meet EN55022 Class A with parallel an external capacitor to the input pins.
    Recommend: 24Vin : 6.8μF/50V 1812 MLCC
    48Vin : 2.2μF/100V*2 PCS 1812 MLCC.
11. An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.
    The filter capacitor Power Mate suggest: Nippon chemi-con KY series, 220μF/100V, ESR 48mΩ.

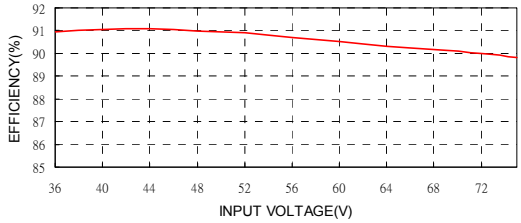
FEC60-48S05 DERATING CURVE



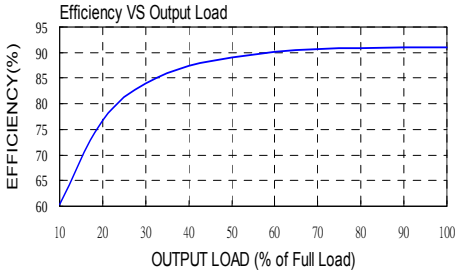
FEC60-48S05 DERATING CURVE
WITH HEATSINK (Note 9)

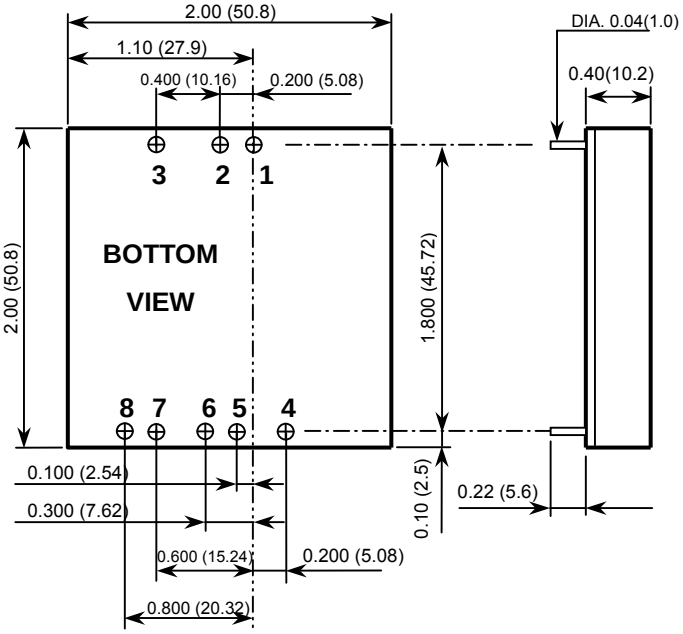


FEC60-48S05
Efficiency VS Input voltage



FEC60-48S05
Efficiency VS Output Load

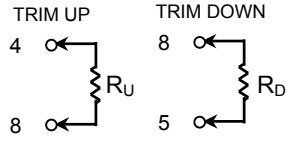


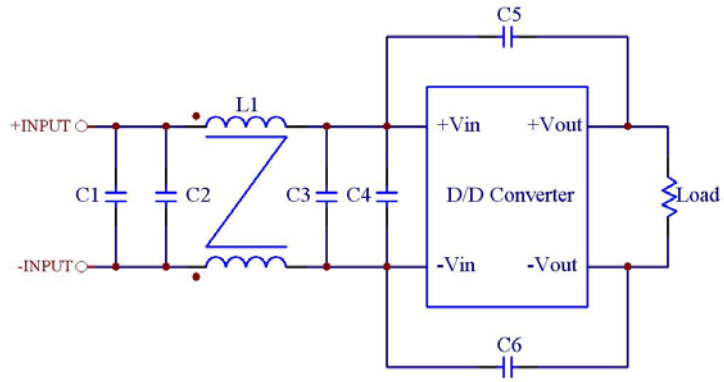


1. All dimensions in Inches (mm)
   Tolerance: X.XX±0.02 (X.X±0.5)
   X.XXX±0.01 (X.XX±0.25)
2. Pin pitch tolerance ±0.01(0.25)
3. Pin dimension tolerance ±0.004 (0.1)

PIN CONNECTION	
PIN	SINGLE
1	+INPUT
2	-INPUT
3	CTRL
4	-SENSE
5	+SENSE
6	+OUTPUT
7	-OUTPUT
8	TRIM

Output can be externally trimmed by using the method shown below.

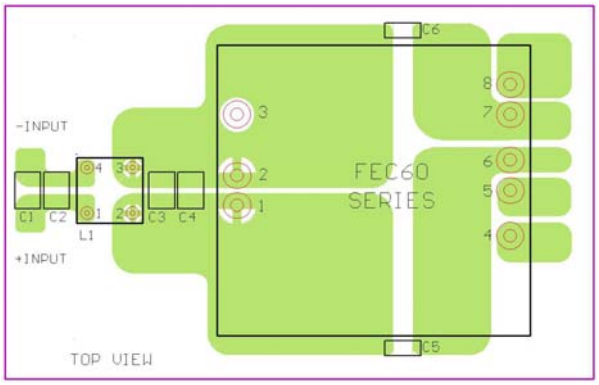




Recommended Filter for EN55022 Class B Compliance

The components used in the above figure, together with the manufacturers' part numbers for these components, are as follows:

	C1	C2	C3	C4	C5 & C6	L1
FEC60-24xxx	4.7μF/50V 1812MLCC	N/A	4.7μF/50V 1812MLCC	N/A	1000pF/2KV MLCC	450μH Common Choke PMT-048
FEC60-48xxx	2.2μF/100V 1812MLCC	2.2μF/100V 1812MLCC	2.2μF/100V 1812MLCC	N/A	1000pF/2KV MLCC	830μH Common Choke PMT-053



Recommended EN55022 Class B Filter Circuit Layout